



# DQMH In TestStand

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~jiggawax~



Founder



# Agenda

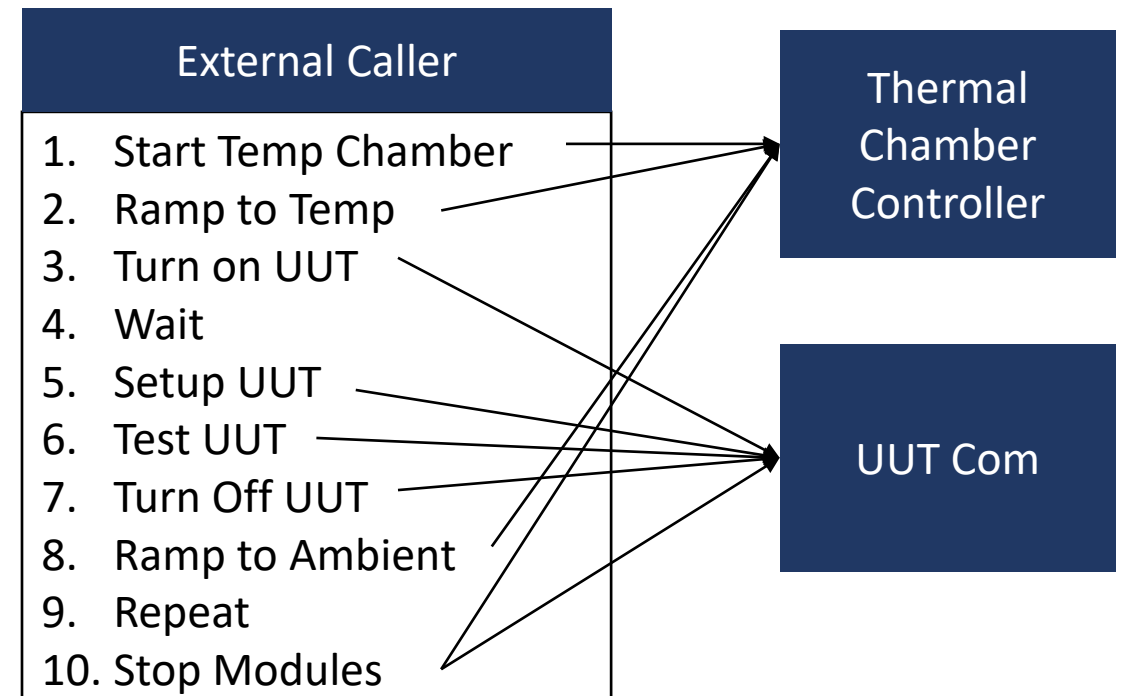


- Brief Overview Of DQMH
  - Module Types
  - Events
- The role of TestStand
- Handling Events
  - Request
  - Broadcast
  - Request and Wait for Reply
- Debugging
- Demo
- Deployment

# DQMH Modules



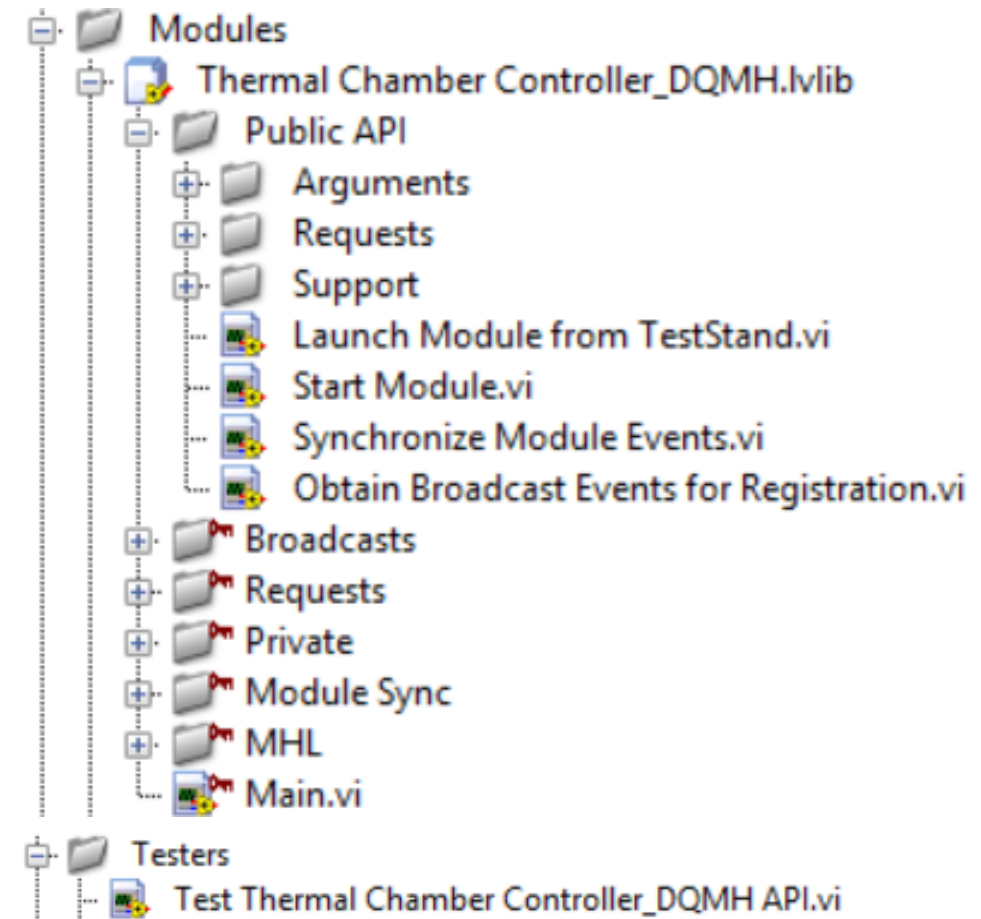
- A group of VIs that are related
- Own memory space
  - Can store data
- Easily reusable
- Uses Queued (silent) Messages to communicate
- External Callers can call modules at any point



# A look inside of a module



- Main.vi
  - Basically the brains for the module
- Public API
  - VIs that tell the module to do something
  - Start Module, Obtain Broadcast Events, Do Something, Show Panel, Hide Panel, Etc...
- Private VIs
  - Anything that helps the module that is not exposed to callers
- Testers
  - Technically not part of the module
  - VERY IMPORTANT!
  - Mimics external caller



# 2+ Types of Modules



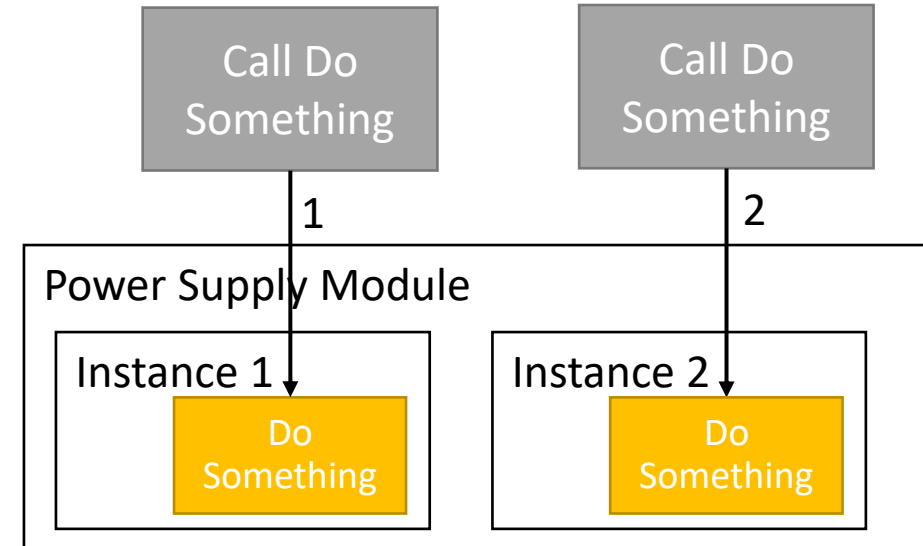
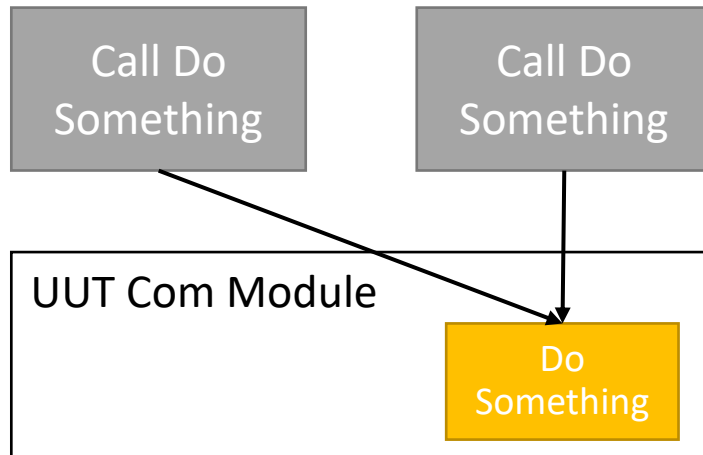
## Singleton

- Can only have 1 instance in memory at a time
- Any call to the Public API will be to the single instance

## Cloneable

- Can have multiple instances in memory at a time
- Call Public API methods by using a unique id

External  
Caller



# Events



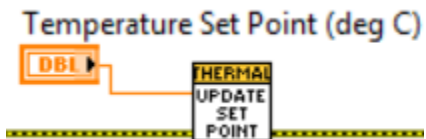
- Ways to get information to and from a DQMH module
- The “API” for DQMH module
- Types of Events:
  - Request
  - Broadcast
  - Request and Wait for Reply
  - Roundtrip

# Request Event

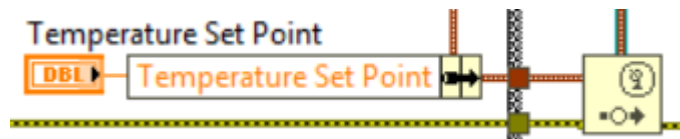


Request – External Caller tells DQMH Module to do something

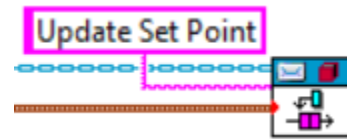
1- Caller Sends Request



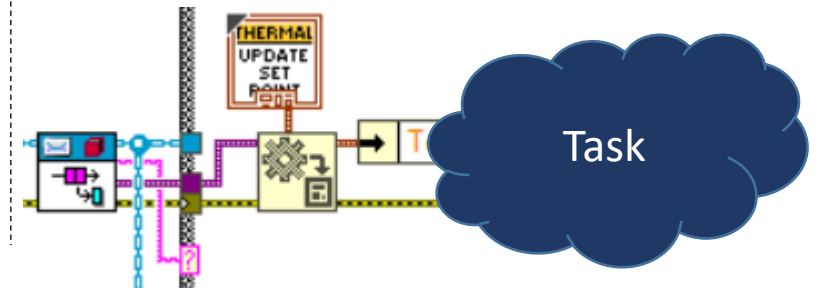
2- Public API Triggers Event



3- Main.vi Event Handler Enqueues



4- Main.vi Message Handler Loop Dequeues and performs task

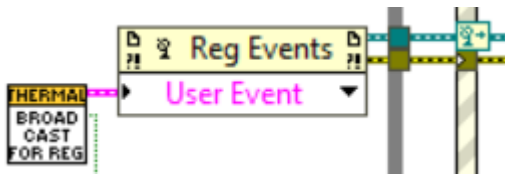


# Broadcast Event



## Broadcast – DQMH Module gets data to the External Caller

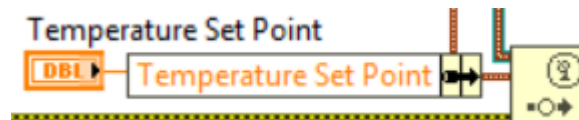
1- Caller Registers for Events



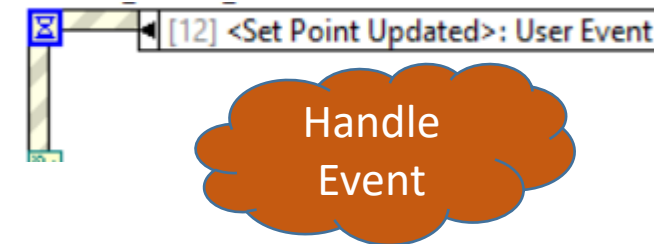
2- Main.vi calls broadcast vi at some point



3- Broadcast vi triggers event with message



4- Caller handles event





# Request and Wait For Reply Event



Request and Wait For Reply – External Caller requests information from DQMH Module

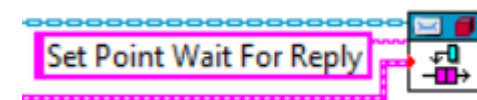
1- Caller calls Public API



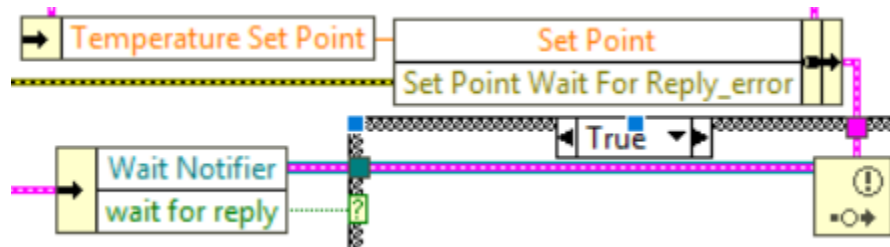
2- Public API triggers event



3- Main.vi Event Handler Enqueues



4- Main.vi Message Handler does task and triggers notifier



5- Public API waits on Notifier and returns payload



# Roundtrip



Request and Wait For Reply – External Caller requests information from DQMH Module



Broadcast – DQMH Module gets data to the External Caller

# The role of TestStand



External Caller Layer



BHAG  
Big Hairy  
Audacious  
GUI

DQMH Power  
Supply Tester.vi



DQMH Module Layer



Thermal  
Chamber  
Controller

UUT Com

Power Supply

Whatever

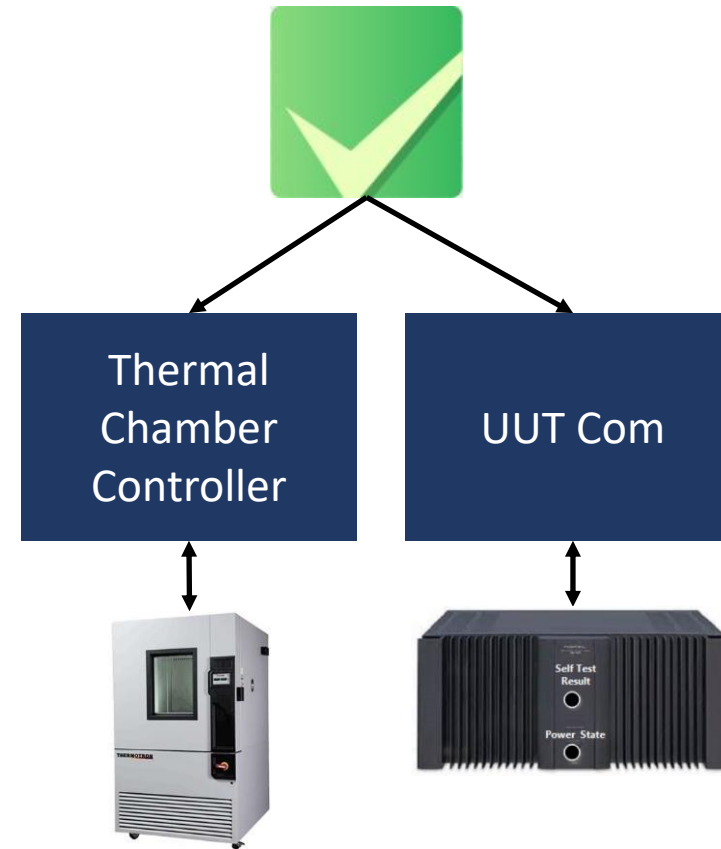
Low Level Layer  
Hardware Layer



# Calling Modules From TestStand



- Requests
- Request and Wait for Reply
- Broadcast



# Call Request



- Requests
- Request and Wait for Reply
- Broadcast

- Call as a normal step
- Does not care about acknowledgement

## Test UUT

Setup (0)		
Main (12)		
Power On Device Under Test an...		
Power Off Device Under Test	Action, Set Power State.vi	Result Recording: Disabled
Show Device Under Test Panel	Action, Show Panel.vi	Result Recording: Disabled
Wait ONLY to allow user to see i...		
Wait	TimeInterval(2)	Result Recording: Disabled
Power On Device Under Test	Action, Set Power State.vi	Result Recording: Disabled
Wait	TimeInterval(2)	Result Recording: Disabled
Perform Self Test	Action, Perform Self Test.vi	Result Recording: Disabled
Wait	TimeInterval(2)	Result Recording: Disabled
Power Off Device Under Test	Action, Set Power State.vi	Result Recording: Disabled
Wait	TimeInterval(2)	Result Recording: Disabled
Hide Device Under Test Panel	Action, Hide Panel.vi	Result Recording: Disabled
<End Group>		
Cleanup (0)		

# Call Request and Wait for Reply



- Requests
- Request and Wait for Reply
- Broadcast

- Call as a normal step
- Will thread lock until complete



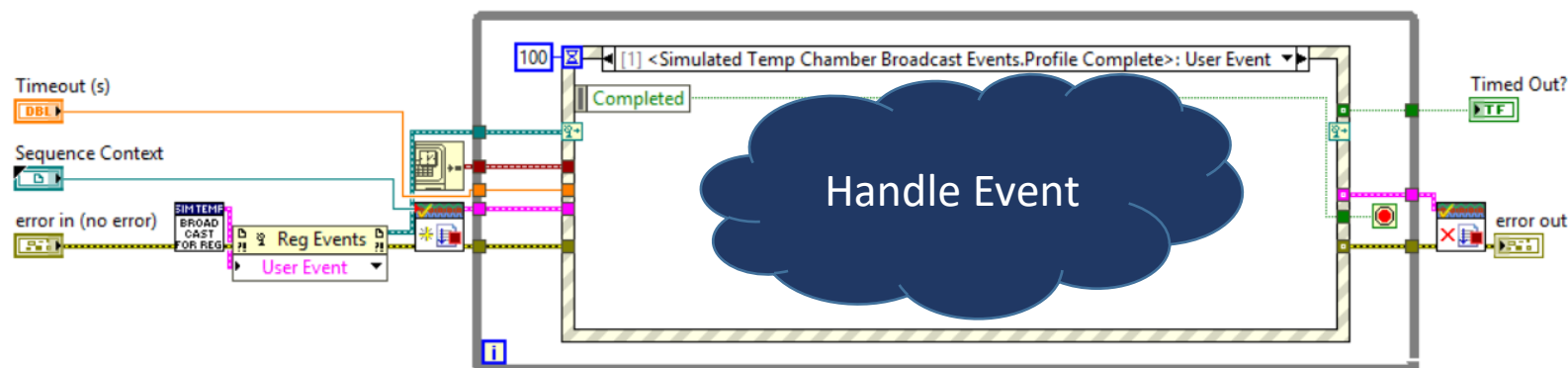
Won't  
execute until  
step returns  
or timeout

# Call Broadcast



- Requests
- Request and Wait for Reply
- Broadcast

- Create a VI to handle event

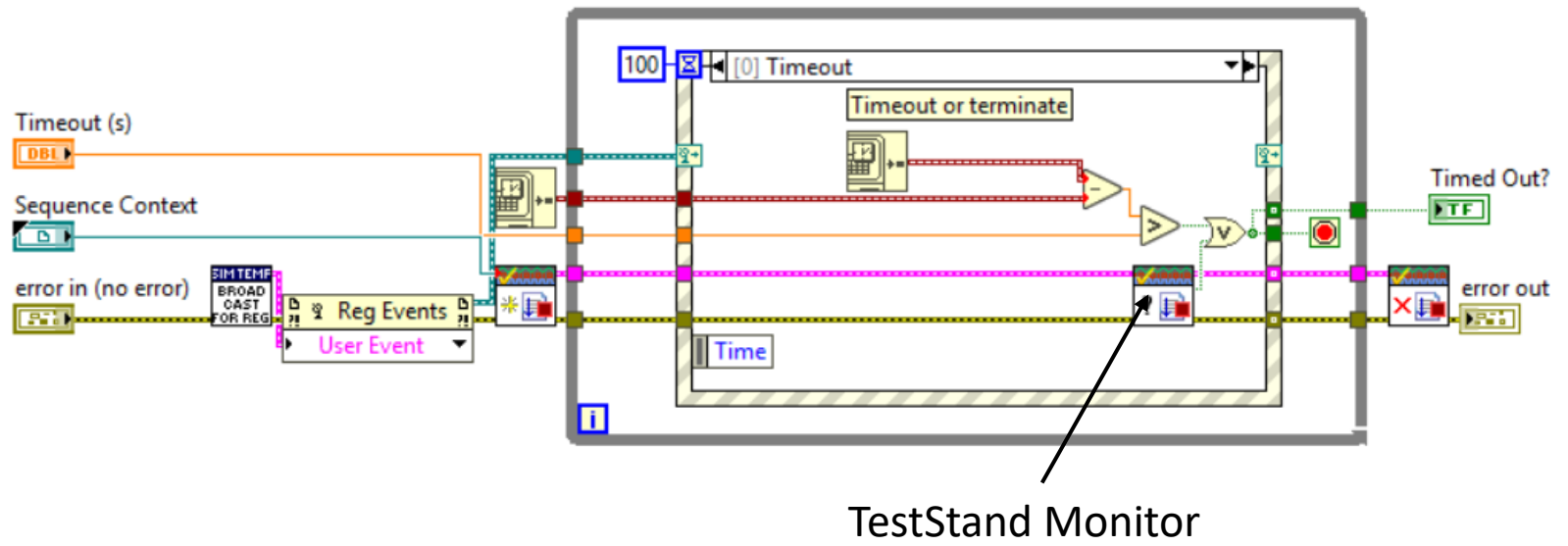


# Call Broadcast – Exit Strategy



- Requests
- Request and Wait for Reply
- Broadcast

- Need an Exit Strategy – could throw an error
- Use the TestStand Monitor for termination





# Call Broadcast – Asynchronous



- Requests
- Request and Wait for Reply
- Broadcast

- Need to be asynchronous? Call in new thread

Call in New Thread

Wait For Thread

The screenshot displays the TestRact interface. On the left, a 'Sequences' pane shows a tree with 'MainSequence'. The main area, titled 'Steps: MainSequence', contains a table with the following steps:

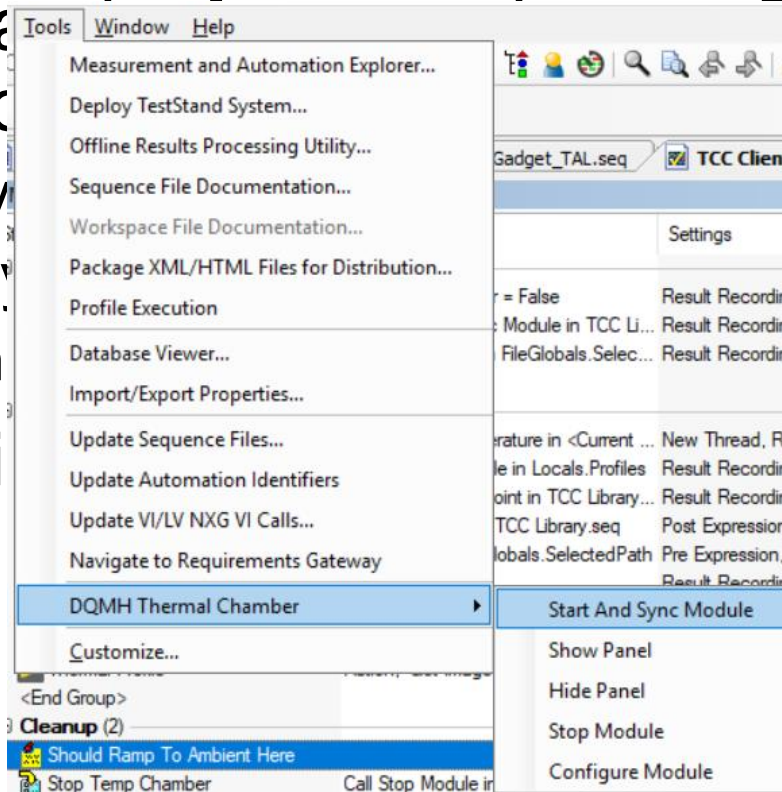
Step	Description
Setup (0)	
Main (8)	
Wait For Profile To Complete	Call Is Complete in TCC Library.seq
Action	Action
Action	Action
Action	Action
Action	Action
Action	Action
Wait for Completion	Thread(Wait For Profile To Complete
<End Group>	
Cleanup (0)	

A blue cloud labeled 'Other Stuff' is positioned over the 'Action' steps. Below the main table, the 'Step Settings for Wait for Completion' dialog is open, showing the 'Wait Settings' tab. The 'Wait for:' section has three radio buttons: 'Time Interval', 'Time Multiple', and 'Thread' (which is selected). The 'Specify by Sequence Call:' section has a radio button selected, and a dropdown menu shows 'Wait For Profile To Complete'. The 'Specify by Object Reference to the Thread' section is also visible.

# Other Considerations



- Place all DQMH calls into a library (e.g. Temp Chamber Library.seq)
- Do not use any TestStand (unless that is its purpose)
  - It should be completely self-contained
  - Can be used by LV only
  - Create a Layer if you need it
- Debug Capabilities using DQMH module 2 (e.g. Broadcast)



# Demo

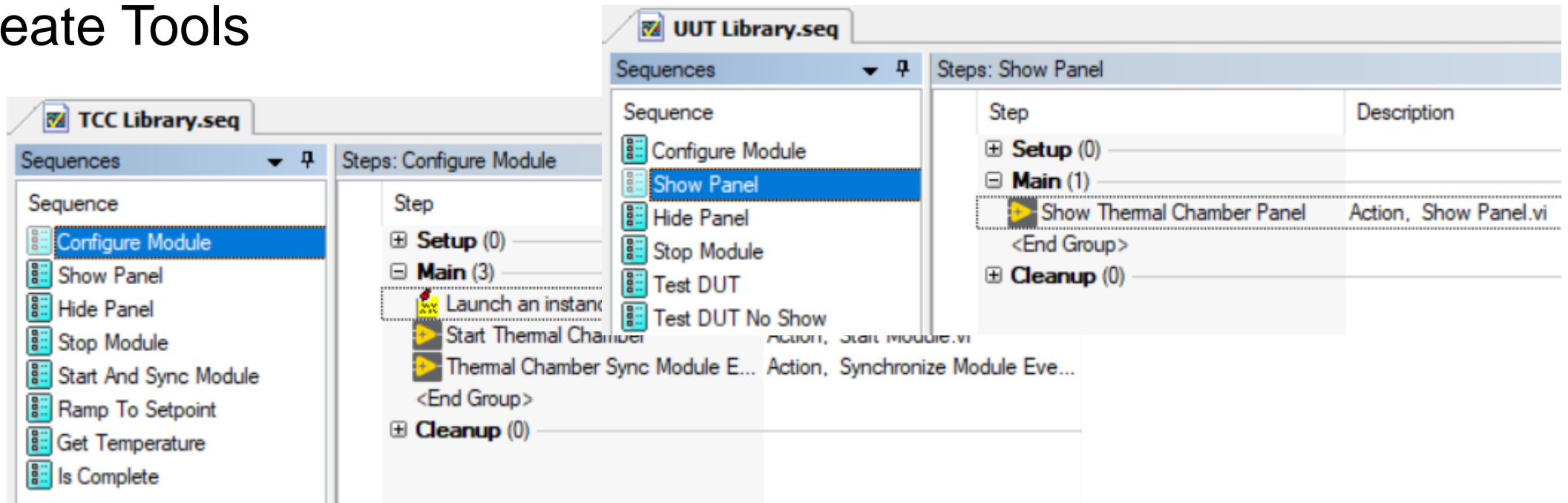


- Add UUT Tools

# DQMH Sequence File Libraries



- Only call DQMH from here
- Share between all TestStand code
- Create Tools

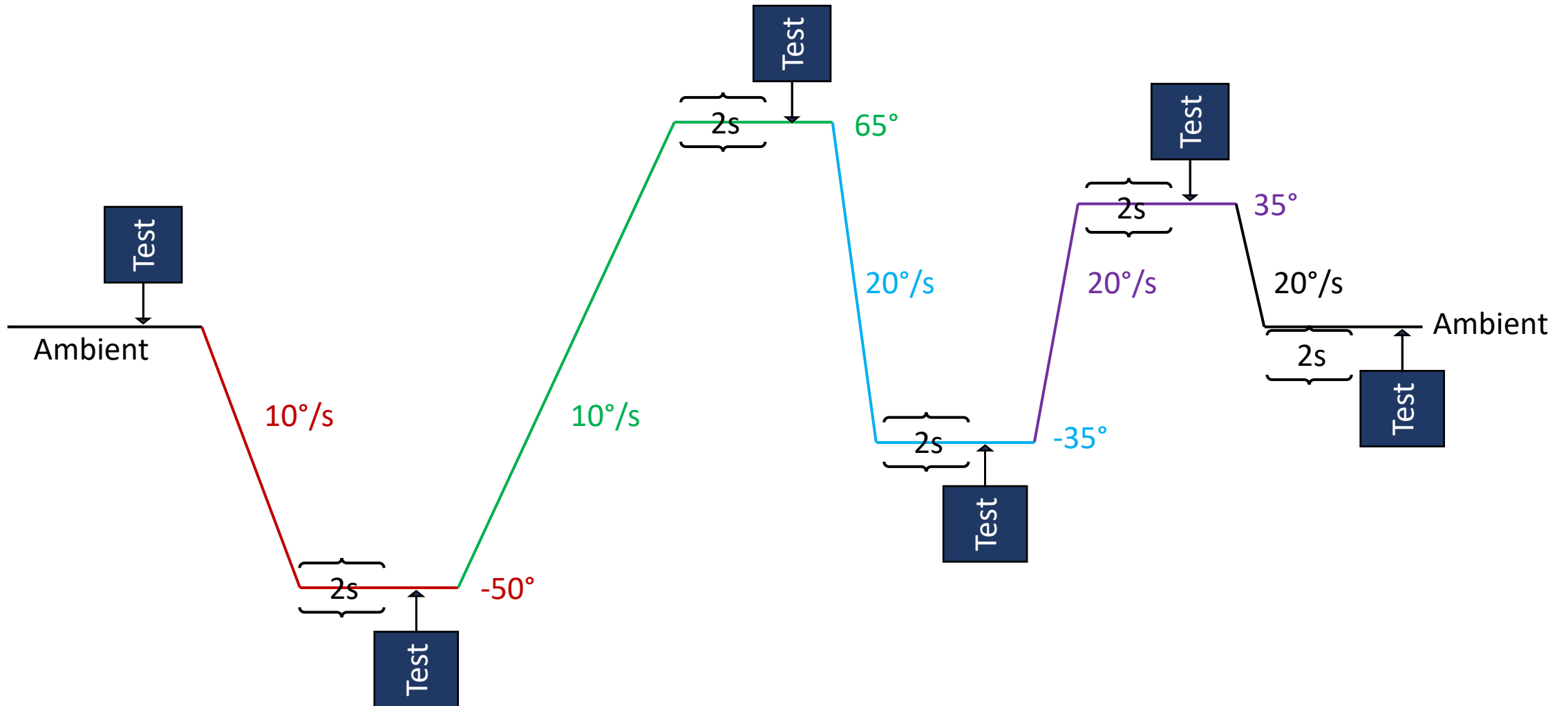


# Scenario – User Story



- Thermal testing a UUT
- Test at ambient before starting. If fail then don't test.
- Cycle cold to -50@10deg/sec, hold for 2 seconds then test UUT
- Cycle hot to +60@10deg/sec, hold for 2 seconds then test UUT
- Cycle cold to -35@20deg/sec, hold for 2 seconds then test UUT
- Cycle hot to +35@20deg/sec, hold for 2 seconds then test UUT
- Cycle to ambient@20deg/sec, hold for 2 seconds then test UUT

# Scenario - Architecture

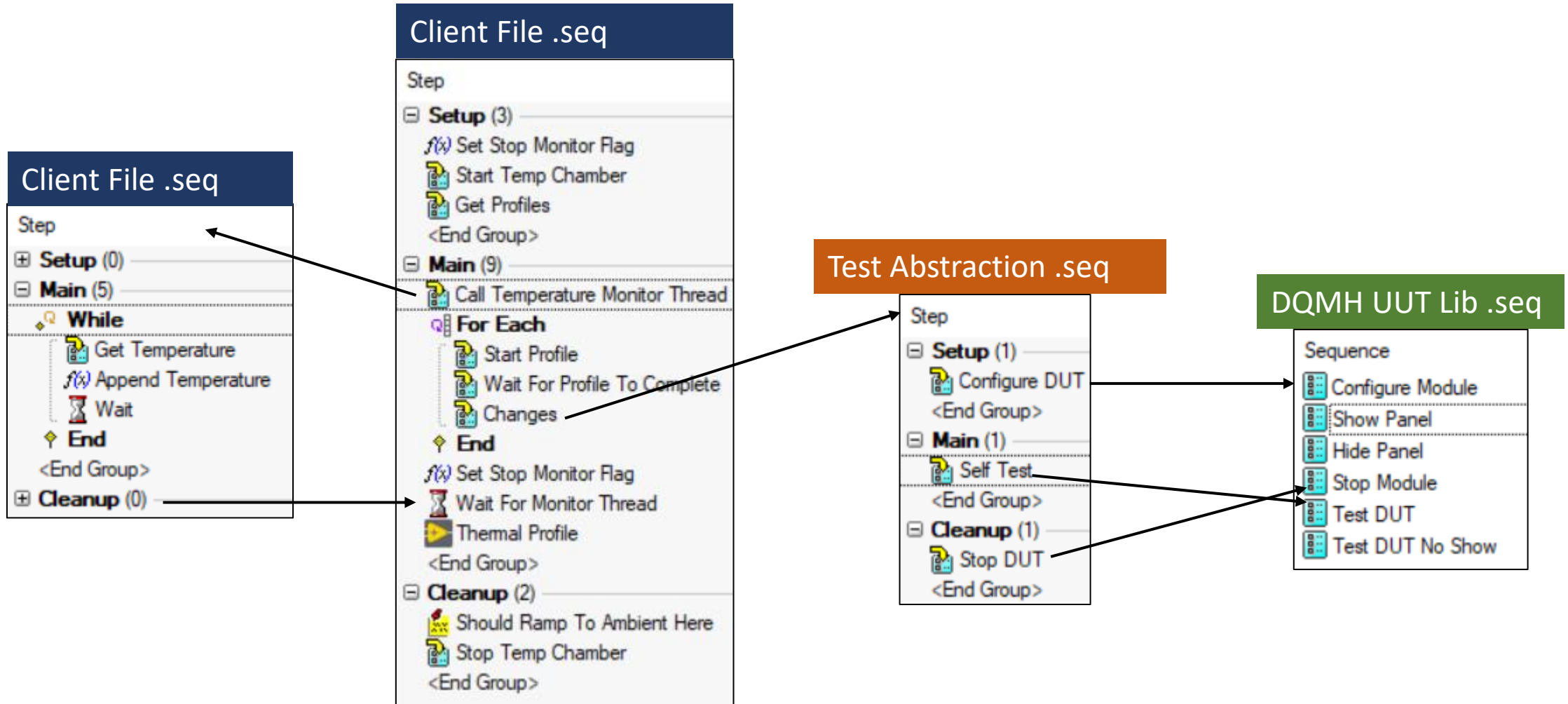


# Scenario - Table



Cycle	Setpoint (°C)	Ramp Rate (°C/s)	Hold Time (s)
Ambient	22	0	0
1 Cold -50	-50	10	2
1 Hot +65	+65	10	2
2 Cold -35	-35	20	2
2 Hot 35	35	20	2
3 Ambient	22	20	2

# Thermal Example Architecture





# Demo



- Thermal Chamber Demo
- Show DQMH TestStand libraries
- Explain the thermal chamber demo
- Execute
- Use Tools to show and hide panel

# Deployment



- Create Packed Project Libraries from your DQMH modules
- Deploy DQMH Library and Module separate from other code



DQMH DAQmx  
Library.lvlibp



DQMH DAQmx  
Library.seq